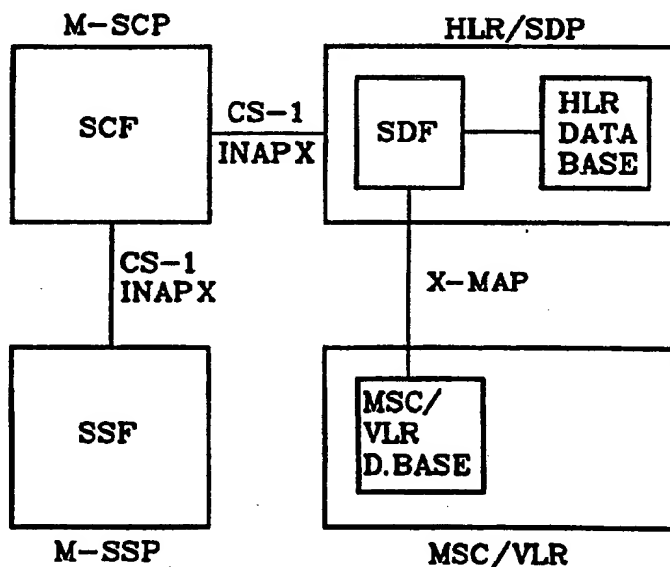# PCT

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(54) Title: INTELLIGENT MOBILE TELECOMMUNICATIONS NETWORK ARRANGEMENT

(57) Abstract

The present invention relates to an intelligent mobile telecommunications network arrangement providing services. The network arrangement comprises means for providing communication within the Mobile and Intelligent Networks respectively and between at least one logical node of the Intelligent Network and at least one logical node of the Mobile Network. These means comprise first means (X-MAP) providing communication between a first logical node of the Mobile Network and a second logical node of the Mobile Network. The means further comprises a first interconnecting means (INAPX) separate from said first intraconnecting means (X-MAP), for providing communication between said first logical node of the Mobile Network (HLR/SDP) and a first logical node of the Intelligent Network (M-SCP).

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INTELLIGENT MOBILE TELECOMMUNICATIONS NETWORK ARRANGEMENT.

5   TECHNICAL FIELD

The present invention relates to an intelligent mobile tele-
communications Network arrangement providing services comp-
rising means for providing communication within the Mobile
and Intelligent Networks respectively and between at least
10   one logical node of the Intelligent network and at least one
logical node of the Mobile Network, said means comprising
first intra-connecting means (X-MAP) providing communication
between a first logical node, and a second logical node of
the Mobile Network.
15

The invention further relates to a method for providing
services such as e.g. Personal Communications Services in a
Mobile Intelligent Network.

20   More generally the invention can be said to relate to intel-
ligent networks in a mobile environment or a mobile applica-
tion of intelligent networks. Generally within telephony and
particularly within mobile telephony the need for more and
more advanced services or products is rapidly increasing and
25   products and services are wanted which are more advanced and
even not yet defined by the basic network standards. There
is a pressure that telecommunications become more and more
personal, i.e. personalized in a number of different fields.
The interest in so called Intelligent Networks has become
30   substantial but the combination with mobility or Mobile Net-
works is complicated and a number of Intelligent Network
Services are not available to mobile subscribers and others
are not available in an appropriate or in the best way at the
same time as mobility is provided. Essential is that for
35   Mobile Intelligent Networks the location of the calling
subscriber cannot be concluded from the calling subscriber
number as is the case for fixed subscribers. On the contrary,

the subscriber could be anywhere. It is furthermore essential that the location of the called subscriber cannot be concluded from the called subscriber number.

5   STATE OF THE ART
    According to the ITU-T intelligent network recommendations, the Capability Set 1, CS 1, Service Independent Building blocks, SIBs give a flexible service configuration since the concept of the intelligent network opens the interface
10 between the Service Switching Functions, SSF, and the Service Control Functions, SCF. Earlier those were integrated internally in the switching systems. Depending on the particular support data such as for example the screening list, the call instance data it was acting on, such as e.g.
15 calling party number, and its immanent logic such as e.g. to screen a number, the SIB behaves in different ways. With the SIB logic a controlling relationship can be established between the node that holds a Service Control Function, the Service Control Point, SCP, and the node that holds the
20 Service Switching Functions, the Service Switching Point, SSP. For example a Specialized Resource Function, SRF, can be invoked if user interaction is acquired, e.g. collect digits. This function as well as others may be stand alone as an Intelligent Peripheral, IP, or it may be integrated in
25 the Service Switching Point, SSP. Communications are provided by applying the functionality which is provided by the Intelligent Network Application Part Protocol, INAP. The signalling is carried out according to the CCITT-signalling system No. 7.

30
    Also the European Telecommunications Standards Institute has elaborated an implementable intelligent network protocol which is called ETSI-Core INAP.

35 Following the above mentioned standards a number of opera-tions can be carried out. However, a number of operators run Intelligent Networks essentially based on supplier specific

solutions.

Fig. 1 describes a network configuration for Mobile Intelli-
gent Network Services in GSM 900/DCS 1800. The GSM-system as
specified by the ETSI-standards comprises among others the
following nodes: Home Location Register, HLR, Mobile
Switching Centre, MSC, Visitor Location Register, VLR and the
Base Station System, BSS and the Intelligent Network is
specified by ITU-T in the Q.1200 series Recommendations and
by ETSI in the Intelligent Network (IN); Intelligent Network
Capability Set 1 (CSI), Core Intelligent Network Application
Protocol (INAP) ETS 300374 standard (DE/SPS-3015
recommendations) and comprises among others the following
nodes: Service Switching Point, SSP, Services Control Point,
SCP, and Service Data Point, SDP. The network configuration
is illustrated in Fig. 1 and corresponds to a dedicated
overlay Intelligent Network for mobile subscribers. Generally
a combination of M-SSP and a M-SCP. i.e. a M-SSCP or Mobile
Service Node is used by the operators which apply the Intel-
ligent Network. Access to Mobile Intelligent Network Services
is provided to the subscribers which have been given an
Intelligent Network access category in the Home Location
Register, HLR. This category can be split into one category
for calls to a mobile subscriber and another category for
calls from the mobile subscriber. The last category is also
transferred to the Visitor Location Register, VLR, if the
mobile subscriber changes the area which is covered by a
Visitor Location Register, VLR, i.e. location updating.
Special outgoing routes to the M-SSP are defined in the
gateway and the visited Mobile Switching Centres, G/MSC,
which are selected if the triggering criteria are met. The
calling party number and the called party number but also the
location of the calling party is provided to the M-SSP and
forwarded to the Mobile Service Control Point, M-SCP. The
accessed mobile Intelligent Network services must have been
previously created and activated in the Mobile Service
Control Point, M-SCP, with the use of the Service Creation

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Environment Function, SCEF, which is built on top of the
Operation and Maintenance System, OMS. This is however not
shown in the figure. In fig. 1 which is an overlay network
a continuous line relates to a bearer connection whereas a
5   dashed line relates to signalling (signalling system No. 7).
ISUP denotes the Integrated Services User Part and TUP deno-
tes the Telephone User Part.

If a call is re-routed from the Intelligent Network to the
10   Mobile Network, it is possible to indicate that no announ-
cement shall be given to the calling subscriber in the Mobile
Network in case the called mobile subscriber is not
reachable. Therethrough the IN can get control back over the
call and execute the adequate action depending on the service
15   allocated to the subscriber in the IN.

In 41 IEEE Vehicular Technology Conference (May 19-22, 1991,
St. Louis, MO) Akihisa Nakajima et al, "Intelligent Digital
Mobile Communications Network Architecture for Universal
20   Personal Telecommunications (UPT) Services, pp 83-87, an
Intelligent Digital Mobile Communications Network, "IDMN",
architecture is illustrated. The network described therein
is divided into two layers, a transport layer for trans-
portation of user information and an intelligent layer
25   controlling services. GATE-MSC (G-MSC) is included in the
transport layer as well as the V-MSC since they provide
communication parts and the Home Location Register, HLR, is
included in the intelligent layer. Both the intelligent layer
and the transport layer are hierarchical and subdivided into
30   two levels.

WO 93/18606 describes an integrated wired and wireless
communication network. It is intended to provide mobility
using the intelligent network IN wherein the IN nodes act as
35   mobile network nodes. A mobile specific protocol (IS-41) is
used between network nodes, and it is intended to achieve
mobile functionality via the IN. The fetching of data from

PLMN always relates to incoming calls and a substantially normal interface can be said to be provided between entities of the cellular network. The invention described in this document merely relates to Personal Communications Service (PCS) and not to similar (service data) functionality which cannot be achieved through the teaching of this document.

Thus, none of the shown intelligent Mobile Network architectures will take into consideration that the Intelligent Network service subscriber is really mobile or on the move in a number of the Intelligent Network Services which are suggested by e.g. the Capability Set 1. Thus they are not really adapted for mobile subscribers. Therefore, a number of requirements cannot be fulfilled e.g. as to the reachability of the subscriber, information on the subscribers location, e t c, and several sophisticated and demanding personalized services cannot be provided.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a network arrangement as initially referred to in which, particularly for mobile subscribers, services can be provided which are sophisticated, personalized and differentiated. Particularly it is an object of the invention to provide an arrangement with which products and services can be offered and provided which are more elaborate and extend beyond what has been possible with basic network standards. It is an object of the present invention to enable the Intelligent Network to provide services specific for mobile subscribers, e.g. mobile GSM subscribers but also others. It is furthermore an object of the present invention to personalize the services and to provide for a greater variety of services particularly for mobile subscribers. The network arrangement according to the invention particularly enables for mobile subscribers to communicate in such a way that the probability of success is high, with a high availability, i.e. at any convenient time, e t c, in such a way that e.g. specialized personal services

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such as e.g. Personal Communication Services are available to the mobile subscriber. This means that it is a particular object of the invention that transfer of information is possible at any time.

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It is particularly an object of the invention to allow the implementation of advanced IN Services in a Service Control Point, SCP. It is also an embodiment of the invention to offer the possibility of interface to other networks/vendors
10   that request mobile specific data.

These as well as other objects are achieved with a network arrangement wherein the means for providing communication further comprises first interconnecting means (INAPX;INAPX')
15   separate from said intraconnecting means for providing communication between a logical node of the Mobile Network (an MN-node) and a first logical node of the Intelligent Network or a so called IN-node.

20   A method for providing Intelligent Network services in a Mobile Network as initially referred to comprises the following steps:
      –   the incoming call is routed to a Service Switching
             Point of the Intelligent Network
25   –   the Service Switching Functions of the Service Swit-
             ching Point collects relevant data,
      –   the Service Switching Functions communicate via data
             to another logical node of the Intelligent Network,
             the Service Control Point via a second signalling pro-
30   tocol, an extended Intelligent Network Application
             Part(INAPX; INAPX'),
      –   the Service Logic Programme interpreters the data
      –   the Service Control Functions (SCF) requires data from
             the Mobile Network via the extended second signalling
35   protocol, Intelligent Network Application Part X
             (INAPX;INAPX'),
      –   the Home Location Register/Service Data Point

(HLR/SDP) in the Mobile Network require data from the
Mobile Switching Center/Visitor Location Register
(MSC/VLR) database or at least part of the data is
provided directly from MSC/VLR to M-SCP via INAPX',

5   -   the Home Location Register/Service Data Point
(HLR/SDP) provides the Service Control Functions of
the Intelligent Network with at least some of the
required data

-     the Service Control Functions (SCF) continue with

10   service interpretation and execution.

Advantageous embodiments of the invention are given by the
appended subclaims.

15   For example the first intraconnecting means advantageously
comprises a first signalling protocol providing communication
between a first and a second node of the mobile network, the
first signalling protocol comprising an extended mobile
application part. The first interconnecting means comprises

20   advantageously an intelligent network application part.

Moreover, advantageously the first and the second logical
Mobile Network nodes comprise a Home Location Register and
a Mobile Switching Center/Visitor Location Register

25   respectively.

Particularly the first interconnecting means connects the
first logical IN-node, which may be a Service Control Point
with the first logical MN-node, e.g. the Home Location

30   Register. Alternatively it may interconnect the first logical
IN-node with (at least) the second logical MN-node, i.e.
MSC/VLR.

Particularly the first extended interconnecting means also

35   provides for signalling between a first and a second logical
IN-node, e.g. a Service Control Point and a Service Switching
Point.

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Particularly a telecommunications system is provided which comprises a cellular mobile network and an intelligent network. Wherein communication is provided between at least one logical node of the mobile network and at least one
5   logical node of the intelligent network. Means for providing communication between the nodes of the mobile and intelligent networks respectively comprises a second signalling protocol interconnecting a service switching point with a first logical node of the mobile network which node forms a service
10   data point to the intelligent network so that data can be transferred at substantially any time between the mobile network and the intelligent network.

More particularly still the first the first logical node of
15   the mobile network is a Home Location Register and the first intra-connecting means provides communication between the Home Location Register and a Mobile Switching Center/Visitor Location Register of the mobile network. The first intra-connecting means are separate from the first inter-connecting
20   means.

BRIEF DESCRIPTION OF THE DRAWINGS
The invention will in the following be further described under reference to the accompanying drawings in which
25
     Fig. 2   illustrates one way for the (Mobile) Intelligent
                   Network to access to information in the Mobile
                   Network,
     Fig. 3   illustrates a network arrangement for GSM 900/DCS
30   1800 wherein SSF are integrated in MSC and G-MSC,
     Fig. 4   schematically illustrates the access of the HLR
                   via the CS1-INAP protocol,
     Fig. 5   shows a flow diagram illustrating Service Data
                   function procedures in GSM PLMN and
35   Fig. 6   illustrates a further embodiment for interconnec-
                   tion of network nodes or access to information.

DETAILED DESCRIPTION OF THE INVENTION

In the following an embodiment is described wherein the Mobile Network applies the GSM-standard although it is clear that the arrangement according to the invention is not

5   restricted to comply with the GSM-standard.

As a start, the nodes comprised by the GSM-system as specified by the ETSI-standards and the nodes comprised by the Intelligent Network as specified will be described.

10

It is also clear that the invention is not limited to any of the given standards referred to as far as the intelligent network IN is referred to either. The GSM-system comprises the a.o. following nodes: Home Location Register, HLR, Mobile

15   Switching Center, MSC, Visitor Location Register, VLR and the Base Station Systems, BSS. These nodes will now be shortly described.

The Home Location Register,HLR, is a database which is used

20   for the management of mobile subscribers, The number of them in a Public and Mobile Network, PLMN, varies according to the characteristics of the PLMN itself. The information which is stored in the HLR is generally of two basic types, namely subscription information and a part of the mobile location

25   information allowing incoming calls to be routed to the Mobile Switching Center, MSC, for said Mobile. Administrative actions by the network operator on subscriber data are carried out in the Home Location Register, HLR. The Home Location Register, HLR, furthermore stores the identies which

30   are essential to the system. These are the International Mobile Subscriber Identity, IMSI, the Mobile Station ISDN-number and the address of the Visitor Location Register, VLR, where the mobile subscriber currently is located.

35   The Mobile Switching Center, MSC, is a switching center that holds all the switching functions which are needed for mobiles located in an associated geographical area, also

called an MSC-area. The Mobile Switching Center, MSC, takes into account the mobile nature of its subscribers and manages the necessary radio resources, especially those procedures which are required for handling and updating of the location
5   registration and for carrying out the handover.

The Visitor Location Register, VLR, is a functional unit which dynamically stores subscriber information, e.g. location area when the subscriber is in the area of which that
10   particular VLR is in charge. When a roaming mobile enters an MSC area, the MSC informs the associated VLR thereof. The mobile then enters the registration procedure wherein it is assigned a Mobile Subscriber Roaming Number MSRN, or a visited network address which serves to route incoming calls
15   to that particular mobile. Furthermore, the VLR contains information which is needed for the handling of incoming-/outgoing calls. This information is gathered by the VLR via a dialogue with the Home Location Register, HLR, which is associated with the Mobile Subscriber. Further information
20   contained in the Visitor Location Register is temporary mobile subscriber identity if this is applicable, the location area in which the mobile has been registered and data related to supplementary service parameters.

25   Now Base Station System, BSS, will be shortly described. The BSS is the physical equipment which is used to give radio coverage to a determined geographical area called a cell and to comprise the equipment which is needed for communication with a mobile station. Functionally, the Base Station System,
30   BSS, is subdivided into a control function which is carried out by a Base Station Controller, BSC, and a radio transmitting function which is carried out by the Base Transmitter Station, BTS.

35   The Intelligent Network is in the described embodiment specified by CCITT in the Q.1200 series and the ETSI-signalling protocols and switching, Intelligent Network Capability

Set 1, Core Intelligent Network Application Protocol INAP, DE/SPS-3015 recommendations. As referred to above, however, the IN can also take other forms. CS-1 provides network capabilities to support services defined or in the process of being defined by ITU-T (former CCITT), such as e.g. Personal Communication Services, Freephone and Virtual Private Network Services such as Private Numbering plan and also capabilities to support the introduction of services which will not be standardized by ITU-T (former CCITT) and /or not be part of the proposed set of targeted services. In the reference just referred to ETSI defines a subset of the protocol defined in Q.1218.

The Intelligent Network comprises among others the following nodes: the Service Switching Point, SSP, the Service Control Point SCP and the Service Data Point SDP.

The Service Switching Point, SSP, contains detection capability to detect requests for IN-services. Furthermore, it contains capability to communicate with other physical entities which comprise a Service Control Function SCF. Such an entity could e.g. be a Service Control Point SCP. Furthermore, it responds to instructions from the other physical entity. Functionally, the Service Switching Point, SSP, comprises a Call Control Function, CCF, a Service Switching Function, SSF and, when the Service Switching Point, SSP, acts as a local exchange, a Call Control Agent Function, CCAF.

A further node of the intelligent network is the Service Control Point, SCP. This node comprises the Service Logic Programs, SLPs, which are used to provide Intelligent Network services or IN-services. It may or may not contain customer data. An SCP comprises Service Control Functions SCF, and may optionally comprise Service Data Functions SDF. The SCF can access data in SDF either directly or through a signalling network. The SDP can be in the SCP's own network or in

another network. Multiple SCPs may contain the same SLPs and the same data to improve service reliability and to facilitate load sharing between different Service Control Points, SCPs.

The third node category of the Intelligent Network to be described is the Service Data Point, SDP. The Service Data Point comprises data used by Service Logic Programs, SLPs, to provide personalized or individualized services. Functionally, a Service Data Point comprises Service Data Functions, SDF. It can be accessed directly by a Service Control Function SCF, but also through the signalling network. In alternative embodiments it might it also access other Service Data Points, SDPs, in its own as well as other networks.

For communication between different nodes, according to the illustrated embodiment the CCITT-signalling system No 7 is applied. For communication between mobile nodes a protocol, a Mobile Application Part, MAP, is applied, and for communication with nodes of the Intelligent Network, an extended Capability Set 1 Intelligent Network Application Part, INAP, protocol is applied, in the described embodiment it will in the following be called INAPX or INAPX' in a further embodiment. In the invention an extended or enhanced MAP is used, which in the described embodiment will be denoted X-MAP.

In fig. 2 an example of logic interconnection of the PLMN and IN-nodes is illustrated. If an incoming call from the Public Land Mobile Network, PLMN, or the Public Switched Telephone Network, PSTN or ISDN, (this is of course also possible although it will not be further described here) and has to be processed or treated by the Intelligent Network, the call will be routed to the Service Switching Point, SSP, wherein the Service Switching Functions, SSF, collect all the data that is necessary (from the IAM/IAI message Initial address Message/Initial address Informations) which may be indicated

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in a trigger table. The trigger table indicates the data
items to be fetched and sent to SCF per trigger case. IAI is
the call set-up message in the Telephone User Part TUP. IAM
is the Integrated Services User Part message sent at call
5   set-up).

The data is then forwarded by the SSF to the Service Control
Point, SCP. The communication between the two nodes of the
Intelligent Network, SSP and SCP is provided by the Intelli-
10   gent Network Application Part, INAPX protocol which is an
exchanged or extended INAP protocol. The signalling system
No 7 is used. An interpretation is carried out by a Service
Logic Program, SLP. If needed, the Service Control Functions,
SCF, inquire the Mobile Network or the PLMN on data on mobile
15   subscribers, e t c. This will be further discussed later on.
The communication between the Service Control Point compri-
sing the Service Control Functions, SCF of the Intelligent
Network, IN and the Mobile Network, generally MN, or in the
particular case, the PLMN, is provided by the extended inter-
20   connecting protocol, the Intelligent Network Application Part
X, INAP X. As above, the Signalling System No 7 is applied.
The node in question of the Mobile Network (or particularly
the PLMN) is the Home Location Register, HLR, Service Data
Point, SDP, which comprises Service Data Functions, SDF, and
25   a Home Location Register database. If mobile data is
required, the HLR/SDP may require data from the second node
of the Mobile Network, the Mobile Switching Center/Visitor
Location Register, MSC/VLR. This node also comprises Service
Data Functions and a Mobile Switching Center/Visitor Location
30   Register, MSC/VLR database. The communication between the two
logical nodes, HLR/SDP and MSC/VLR in the mobile network is
provided by a first (intra)connecting protocol, the Extended
(Enhanced) Mobile Application Part, X-MAP. When the Service
Control Functions, SCF, of the Service Control Point, SCP,
35   of the Intelligent Network have received the required data,
the Service Control Functions, SCF, continue with Service
Interpretation and Execution. The HPLMN is then seen as a

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Service Data Point, SDP, from the Service Control Point, SCP point of view. HPLMN comprises Home Location Register HLR and MSC/VLR. Data that may be requested by SCF from HLR and by HLR from MSC/VLR is e.g. the Location Number and the Call

5   Delivery Information. The Location Number is a number defined in MSC/VLR assigned for a certain area, e.g. a cell, a group of cells or one or more location areas. The Call Delivery Information indicates to the SCP the probable outcome of a call delivery attempt from IN. The reason for a specific call

10   delivery outcome is provided.
        This will be more thoroughly discussed later on.

        Fig. 5 shows a flow diagram on a global procedure. The Home Location Register, HLR, receives a service request from The

15   Service Control Point, SCP, of the Intelligent Network. When the Home Location Register, HLR, has received the request, it determines if an interrogation to the Mobile Switching Centres/Visitor Location Register, MSC/VLR, has to be done. If no information is required from the MSC/VLR, the Home

20   Location Register, HLR returns the information requested by the SCP of the intelligent network or the concerned error.

        If, however, information has to be provided by the MSC/VLR, the Home Location Register, HLR, determines the International

25   Mobile Station Identity, IMSI-code as well as the Visitor Location Register, VLR, address of the received Mobile Station Integrated Services Digital Network, or the MSISDN. The Home Location Register, HLR, then sends the appropriate message to the correct MSC/VLR. This is only done if the

30   MSC/VLR supports the protocol. When the MSC/VLR has received a request from the Home Location Register, HLR, it determines which kind of data has to be fetched from the Visitor Location Register database and eventually from the call handler in the Mobile Switching Center, MSC. The search key received

35   in the MSC/VLR is the IMSI-code. When the Home Location Register, HLR, receives a result or an error from the concerned MSC/VLR, it maps the received information into the

corresponding result or error which is communicated to the interrogating Service Control Point, SCP, of the Intelligent Network IN.

5   In the particular embodiment, the general requirements on HLR and MSC/VLR respectively will essentially be the following:

On HLR:

10   The extended CS1 INAPX protocol which will be more thoroughly described below is implemented in HLR.

It is further possible to limit the number of processed information requests per time interval in HLR. It is assumed
15   sufficient to do this with fixed parameter settings. If the limit is reached an error indication will be sent to SCP.

The Extended MAP protocol X-MAP as further described below is implemented in HLR.
20
Furthermore the handling of a combined request is handled as described above and HLR does not initiate the X-MAP operation towards MSC/VLR unless MSC/VLR supports the protocol.

25   The requirements on MSC/VLR are firstly that the X-MAP protocol as further specified below is implemented in MSC/VLR wherein further the handling of a combined request is described.

30   In the following the functioning of the HLR in the case of a Location Number request will be discussed.

Further below also a call delivery information request will be described in detail. The invention is of course not
35   limited to these data as well as it is not limited to calls, neither incoming nor outgoing, but transfer of information should be possible at any time. However, upon reception of

a request for provision of the Location Number, HLR analyses the received MSISDN.

If the MSISDN is unknown in HLR, the corresponding indication is returned to the SCP. Otherwise HLR determines the IMSI and

5   the VLR address. If the VLR address is not available, the corresponding indication is returned to SCP, otherwise HLR requests the Location Number from MSC/VLR.

If the IMSI and the VLR address are available, HLR will issue a message towards the concerned MSC/VLR with the IMSI as

10 search key in MSC/VLR and request the Location Number for the concerned IMSI.

A received Location Number is forwarded to the SCP in reply to the requested information. An error indication received

15 from MSC/VLR will be mapped to the corresponding CS1 error and sent to the SCP.

The functioning of the MSC/VLR when a Location Number is requested is the following:

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Upon reception of a request for provision of the Location Number, MSC/VLR fetches the Location Number based on the known location of the subscriber. If the subscriber is unknown in MSC/VLR, a new application parameter indicates

25 whether a so called default Location Number – is to be returned or the corresponding X-MAP error. The provision of the Location Number is independent of the state of the subscriber.

30 In the following the particular requirements on and func-tioning of HLR and MSC/VLR respectively will be discussed in relation to a Call Delivery Information request.

Requirements on and functioning of HLR:

35

Upon reception of a request for Call Delivery Information HLR looks for the subscriber data related to the MSISDN number

received. Analog checks are performed as if HLR would have been asked to provide routing information. For example ISDN Bearer Capability ISDN-BC, High Layer Capability HLC, Low Layer Capability LLC, Closed User Group CUG-Checkinfo and the number of forwardings may be received together with the MSISDN number. Only one Bearer Capability may be received.

If the received MSISDN is the main MSISDN and no BSC (Bearer Service Code) can be derived from the received information, HLR uses the Telephony BSC. The BSC, the number of forwardings and the CUG information are sent in a possible request for Call Delivery Information to MSC/VLR.

SDF-HLR error situations are mapped to the corresponding CS1 errors.

If the result of the checks is that neither routing information nor forwarding information would be delivered to GMSC, the result "call will not be delivered" is returned to the SCP. For SDF-HLR forwarding situations, the result "call will be forwarded" together with a forwarding reason will be delivered.

When the result of the analysis is that a provide roaming number operation would be invoked, a Call Delivery Information request is sent to MSC/VLR. In case MSC/VLR responds with "absent subscriber" the HLR continues the analysis in the same way as when "absent subscriber" is returned in the provide roaming number operation. If a Call Delivery Information result is received from MSC/VLR it is passed to the SCP. For other error causes than "absent subscriber" HLR performs the mapping to CS1 errors.

For all cases except for Single Personal Number which is an optional extra Service not defined in the GSM-standard, HLR analyses the forwarded - to number to check if it is a service number requiring suppression of announcement. The corre-

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sponding information is returned to the SCP.

The functions of the MSC/VLR in the case of a Call Delivery
Information request will now be shortly described.

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Upon reception of a request for Call Delivery Information
MSC/VLR identifies the subscriber by means of the IMSI-code.

If the MSC/VLR does not support the basic service indicated

10   in the Call Delivery Information request, the corresponding
error is returned.

If the MSC/VLR does not identify the IMSI of the subscriber
MSC/VLR responds to the HLR according to an application

15   parameter as referred to above when discussing the func-
tioning of MSC/VLR in relation to a Location Number request.
Either the result "call will be delivered" or an error
indication is returned to HLR. This procedure differs from
the ordinary procedures for the roaming number provision in

20   MSC/VLR.

If the MSC/VLR finds that the identified mobile subscriber
is marked detached then MSC/VLR responds with "absent sub-
scriber" if so indicated by e.g. an exchange parameter for

25   roaming number provision. Otherwise MSC/VLR performs analogue
checks as for the handling of incoming calls with the
corresponding information as provided in the Call Delivery
Information request from HLR. If the number of forwardings
is not included, it is assumed that the number of forwardings

30   is equal to zero.

If the subscriber is idle the result "call will be delivered"
is returned to HLR.

35   If the result of the checks is that the call will be offered
to a busy MS, the result "call will be delivered" is returned
to HLR.

If the result of these checks is that the call will be forwarded before paging, the result "call will be forwarded" with the appropriate reason is returned to HLR. The forwarded-to number is not checked by MSC/VLR. The originating

5   IN category has no impact on the logic. This is also an extra optional service which is not defined in GSM. This service triggers when calls are to be routed to the IN.

If the result of these checks is that the call will neither
10   be forwarded before paging not offered to the subscriber, the result "call will not be delivered" with the corresponding reason is returned to HLR.

The subscriber shall also be considered idle if location
15   updating, paging, fetching of triplets, roaming number provision, storing of MS data or disconnection are going on in MSC/VLR.

In a particularly advantageous embodiment the first signal-
20   ling protocol, i.e. the Extended (Enhanced) Mobile Applica-tion Part, X-MAP, provides communication between the second logical node MSC/VLR of the Mobile Network and the first logical node, HLR of the Mobile Network. The first inter-connecting means or the second signalling protocol provides
25   communication between the Intelligent Network and the Mobile Network, in this case between the first logical node or the Service Control Point of the Intelligent Network (M-SCP) and the first logical node or the MN-node of the Mobile Network, i.e. the Home Location Register/Service Data Point, HLR/SDP.
30
These protocols, X-MAP and INAPX are used to request e.g. either the Location Number, the Call Delivery Information or both for a particular subscriber. Separate and different pro-tocols are in the described embodiment used for communication
35   between HLR and SCP and between HLR and MSC/VLR respectively. One reason for using separate protocols is that some data which is related to the subscriber is only stored in MSC/VLR,

such as e.g. location area, cell and call status information.

In the following the application of the SCP-HLR protocol or
the INAPX is somewhat evaluated.

One aim of the implementation of the extended CS-1-INAPX
protocol between the IN and the MN (GSM) network is to allow
the transfer of information for call delivery from the GSM
network in this particular embodiment towards the IN network.

The retrieved data might be used in the IN network to decide
whether or not to set up a call to a certain mobile sub-
scriber.

Particularly the IN network will access the HLR via the CS1-
INAPX protocol. The PLMN network is seen as an external
database by the IN network. The HLR is the access point that
collects all the requested data and sends it over the CS1
protocol to the SCF. This is schematically illustrated in
Fig. 4.

The Capability Set 1, CS-1, as referred to above defines an
initial subset of IN capabilities. It provides network
capabilities to support services which are or will be defined
by ITU-T (former CCITT) (e.g. Universal Personal
Telecommunication Service, Freephone, and Virtual Private
Network Services such as Private Number Plan). CS-1 also
provides capabilities to support the introduction of services
that may neither be standardized, by CCITT (ITU-T), nor be
part of the proposed set of the targeted services as already
discussed above.

The SDF contains customer and network data for real time
access by the SCF in the execution of an IN provided service.
It interfaces with SCFs as required.
The SDF further contains data relating to the provision or
operation of IN provided services, c.f. ITU-T Q.12XX, "Q-

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Series Intelligent Network Recommendations."

The SCF commands call control functions in the processing of IN provided and/or custom service requests and it may inter-
5   act with other functional entities to access additional logic or to obtain service or user data information required to process a call/service logic instance, c.f. the in the foregoing mentioned reference.

10   As discussed above, the Location Number and the call Delivery Information can be retrieved from the GSM PLMN wherein the Location number indicates the location of a mobile subscriber in the MSC/VLR and wherein the Call Delivery Information indicates the possible outcome of a call to that mobile
15   subscriber. The results can be either that the call will be delivered or that the call will be forwarded (describing the reason) or that the call will not be delivered (describing the reason).

20   It is, as mentioned above, possible to retrieve the Location Number the Call Delivery Information or both informations in one and the same request,

The protocols for the interface between SCP and HLR are in
25   the described embodiment TCAP on SCCP and MTP of Signalling System No. 7.

Particularly a spare SubSystem Number may be assigned to the HLR-SDF application for INAP. In the described embodiment it
30   is also possible to select the SSN per Application (IN Network with the cooperating HPLMN) in the HLR and the SCF, as application parameters.
In a particular embodiment it is e.g. possible to address the HLR-SDF using the MSISDN as global title.
35   Preferably the interface complies with the data retrieval operation as described in the CS1-INAP specification.

22

In the described embodiment only data for one subscriber can be retrieved in one operation but in other embodiments it is possible to retrieve data for more than one person in an operation and particularly it is also possible to update data

5   for one subscriber.

Since the existing specification of the data retrieval operation does not contain all the necessary data to support the functionality of the invention new local Attribute Types

10   are assigned for, such as MSISDN, CUG-Check info (Closed User Group), Network SignalInfo, Number of Forwarding, Location Number and Call Delivery Information.

The format and coding of the MSISDN, CUG-Check Info. Network

15   Signal Info and the Number of Forwarding is particularly defined as specified in GSM TS 09.02.

Preferably the Call Delivery Information includes one of the following reasons:

20

The call will be delivered, or the call will be forwarded including one of the following reasons:

-       Call Forwarding Unconditional CFU is active-operative
25   and announcement suppression applies
-       CFU is active-operative and no announcement suppres-
        sion applies
-       Call Forwarding on Busy CFB is active-operative and
        announcement suppression applies
30 -   CFB is active-operative and no announcement suppres-
        sion applies
-       Call Forwarding on not reachable CFNRc is active-
        operative and announcement suppression applies
-       CFNRc is active-operative and no announcement suppres-
35   sion applies
-       Single Personal Number SPN is active-operative (this
        stands for single personal member which is a supple-

mentary service specified) or

the call will not be delivered including one of the following
reasons:

5   -   The subscriber is busy.
       -       The subscriber is barred.
       -       The subscriber is not reachable.
       -       The maximum number of forwardings has been exceeded.
       -       CUG-Reject
10   -   Subscription violation. Either Bearer Service or
               Teleservice not provisioned.
       -       Any other reason not specified above.

       The local Attribute Types that are needed to retrieve the
15   different data are for Location Information the MSISDN number
       and for the Call Delivery Information the MSISDN number. CUG-
       Checkinfo,   Networksignalinfo   and   Numberofforwarding   are
       optional.

20   Timer values are operator defined within the range specified
       in CS1-INAP specification.

       Upon failure to retrieve the information correctly, in the
       particular embodiment, one of the following errors is retur-
25   ned to SCF upon:

       Attribute Error, which indicates that an attribute given in
       the request is invalid or ambiguous. If none of the attribu-
       tes explicitly listed in selection can be returned, then
30   Attribute Error with "problem: no such Attribute or value"
       is reported.

       Name Error which indicates that the name used to access the
       data item is invalid or finally Service Error which indicates
35   that the SDF database could not be accessed or could not
       perform the operation requested, because for instance VLR
       could not provide the requested information.

The error returned is the one encountered which has the highest priority, the priorities of the errors being the following: Name Error, Attribute Error and Service Error.

5   The above mentioned error cases relate to error cases which are sent as INAP errors on the SDF operations used. The coding of the errors shall be defined as specified in CS1-INAP specification, as in accordance with GSM TS 09.02. The data retrieval INAP-operation is as already described used

10   between the Service Control Point SCP and the Home Location Register, HLR. With the invention a number of generic attributes not foreseen in the recommendations are expanded and defined for mobile specific data. The data which is sent from the SCP to the HLR in the format specified in the GSM TS

15   09.02 is the Mobile Station ISDN-number, the Closed User Group check information or CUG-check-info which is a GSM-specified supplementary service, the Network Signal Information and a Number of Forwarding. In response the Service Control Point, SCP, may e.g. get, as already discussed, the

20   Location Number and/or Call Delivery Information.

If, however, an error occurs, the corresponding reason is sent, according to the recommendations for the data retrieval operation, to the Service Control Point, SCP. The Mobile Data

25   Location Number and Call Delivery Information are inherent to the Mobile Network. The location number is defined as a number defined in MSC/VLR assigned by the operator for a certain area (which as already explained can be one cell, a group of cells or one or several location areas). The format

30   of the location number should be defined as specified in CCITT-Q.763 (white book). The Call Delivery Information thus indicates to the Service Control Point, SCP, the probable outcome of a call delivery attempt from the Intelligent Network, IN as well as the reason for a specific call delivery

35   outcome is provided.

A timer value assigned to this operation appropriately opera-

tor defined within a range as specified in the CS1-INAP
specification.

Call Delivery Information from MSC/VLR to HLR is similar to
5   call Delivery Information from HLR to SCP but it is not
identical. E.g. is some post-processing done in HLR.

In the following the HLR-MSC/VLR protocol or the Mobile
Application Part X-MAP will be discussed. Particularly, in
10   an advantageous embodiment, an Extended or Enhanced Mobile
Application Part is used, X-MAP. Whenever the HLR receives
a request from the IN network to retrieve e.g. call delivery
information and if the requested information is not stored
in HLR, HLR will retrieve the data from MSC/VLR and return
15   it to SCF.

The aim of this requirement is to allow HLR to retrieve
information requested for the IN network not stored in HLR
from MSC/VLR.
20

The interface between HLR and MSC/VLR is the extended MAP
protocol, i.e. X-MAP.

Once the information is fetched, it is transferred to SCF.
25

The retrieved data might be used in the IN network, for
example, to decide whether or not to set up a call to a cer-
tain GSM subscriber.

30   As already mentioned above the Location Number is a number
defined in MSC/VLR assigned for a certain area, which can be
one cell, a group of cells or one or several location areas.
The SDF interfaces with SCFs as required.

35   In the SDF data is contained which relates to the provision
or operation of IN provided services.

A new X-MAP operation, called Retrieve Info for IN, between HLR and MSC/VLR, is introduced to retrieve information not stored in HLR, for GSM subscribers such as for example the Location Number and the Call Delivery Information separately or in one and the same request.

The requirements on MSC/VLR and HLR respectively have already been defined above. - The parameters which are necessary to retrieve the information are: the IMSI-number as a mandatory parameter which is relevant for the Location Information and for the Call Delivery information: the IMSI-number as a mandatory parameter, CUG-check-info, Basic Service Code and Number of Forwarding as optional parameters. Location Information as well as call Delivery information can be retrieved in one and the same request for a particular subscriber. If both the Location Number and the Call Delivery Information is requested and only one of them is available, that one will be returned to the HLR. This does not cause an operational error. The format in coding of the IMSI, CUG-check-info, Basic Service Code and Number of Forwarding is defined and specified in GSM TS 09.02.

The format and coding of the location number shall be defined as specified in CCITT Rec. Q.763 (white book).

The Call Delivery Information includes either the result that the call will be delivered, or the result that the call will be forwarded including one of the following reasons:

CFB is active-operative,
CFNRc is active-operative or
SPN is active-operative, or finally that the call will not be delivered including one of the following reasons:

The subscriber is busy,
The subscriber is not reachable,
The maximum number of forwardings has been exceeded,

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CUG-Reject, Call Forwarding rejected because of CUG violation or any other reason not specified above.

The following errors can be received as result to this
5   operation: Absent Subscriber, Unidentified Subscriber, Data Missing, Facility Not Supported, Unexpected Data Value.

The error code values and applicability shall be in accordance with GSM TS 09.02.
10
The timer value assigned to this operation shall be operator defined within a range of 15-30 seconds.

The above mentioned relates to advantageous embodiments. A
15   further number of different embodiments are of course also possible. In one aspect of the invention it relates to GSM Mobile Specific Intelligent Network Services. One of these services is the routing of a call to the nearest subscriber. The nearest subscriber is hereby understood as the current
20   location and not the nearest subscriber line or nearest default location.

It relates to mobile IN-services that process the location information related to the eventually called subscriber
25   before any through connection is offered or provided. For the use of a Service Logic Program, SLP, which looks for the nearest subscriber (fixed or mobile) to a particular calling subscriber (fixed/mobile) it is possible to calculate the relative distance. The location number of the eventually
30   called subscriber is retrieved by the Service Control Point, SCP, from e.g. GSM PLMN. For example the eventually called subscriber could be the nearest taxi, the nearest repair car or similar. This is of course merely given as examples. The service can be reached by dialling a certain service number
35   which is known by the service users.

A further service is routing of a call depending on the call

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delivery information which is provided by the GSM PLMN to the IN based on the eventually called subscriber. It further relates to IN-services that process the called delivery information related to the eventually called subscriber
5   before any through connection is offered.

A service Logic Program SLP, monitors the call status of an eventually called subscriber with a given frequency or a given time interval. Via this Service Logic Program the
10   calling subscriber can be informed or warned about the current status of the eventually called subscriber or the program can be used to establish a connection to the called subscriber once the eventually mobile subscriber is free or reachable. Particularly the call could be diverted to an
15   announcement or to another destination specified by the subscriber of the service.

The eventually called subscriber referred to is particularly a Mobile Subscriber who wants to be reached by the calling
20   subscriber even if he is busy or not reachable by the network. These services among others can now be provided since the Intelligent Network can request mobile data from the GSM PLMN. GSM PLMN is here merely given as an example. As already discussed above, these data comprise a Location Number and/or
25   Call Delivery Information which is inherent to the Mobile Network.

In a network arrangement the actual status of a mobile subscriber and the current location thereof was not known to
30   the Service Control Point, SCP, before the attempt of a call establishment. With this information the Intelligent Network is able to provide services specific for mobile subscribers, e.g. GSM-subscribers. At the same time the Mobile Network is seen as a Service Data Point, SDP, from the Intelligent
35   Networks point of view.

Furthermore, with known network arrangements it has only been

possible to route calls to the nearest mobile subscriber
based on the identity or location information tied to the
calling subscriber without having information on the location
of the eventually called subscriber. With the present
5   invention the location of a mobile subscriber is known by the
Intelligent Network before any through connection.

In fig. 3 an example of a network arrangement according to
the invention is illustrated. In this particular case it
10   relates to GSM 900/DCS 1800. Continuous lines relates to
bearer connections whereas dashed lines illustrate signal-
ling. The Service Switching Functions are integrated into the
Mobile Switching Centres, MSCs and GMSC. Therethrough the
network resources can be used much more efficiently. It can
15   furthermore be seen that a subscriber data exchange between
the Home Location Register, HLR, and the Mobile Service
Control Point, M-SCP, is effected via the interconnecting
means, INAPX, or the first interconnecting means, which is
a second signalling protocol different from the first
20   signalling protocol X-MAP between a Home Location
Register/Service Data Point, HLR/SDP and the Mobile Switching
Center/Visitor Location Register, MSC/VLR, as discussed above
in relation to Fig. 2. The second signalling protocol, or
INAPX is used also for signalling within the Intelligent
25   Network, i.e. between the Service Switching Point, SSP, and
the Service Control Points, SCP. Calls may be incoming from
PSTN, PLMN and ISDN, i.e. the Public Switched Telephone
Network, the Public Land Mobile Network and the Integrated
Services Digital Network and the Service Switching Point of
30   the Intelligent Network is the logical node of the
Intelligent Network for incoming calls.

In an alternative embodiment an extended signalling protocol
INAPX' also provides direct communication with MSC/VLR which
35   comprises the Service Data Functions. This is illustrated in
Fig. 6.

30

In an alternate embodiment the SCP can update data stored in the HLR and MSC/VLR via an INAP updating operation.

Moreover, MSC/VLR may have an SDF functionality. Then the SCP has to retrieve the IMSI number and the VLR address from the

5   HLR first by sending MSISDN. SCP shall thereby also retrieve subscriber and call status related to data in MSC/VLR throu- gh sending the IMSI number to MSC/VLR within the data retri- eval operation of the INAP1. Therethrough any data available in MSC/VLR can be read by SCP. In a particular embodiment

10   data can be updated in HLR (and MSC/VLR).

The invention shall of course not be limited to the shown embodiments but it can be varied in a number of different ways within the scope of the claims. E.g. may security

15   aspects be considered and the HLR may for example be provided with the ability to verify that the requesting SCF is allowed to access subscriber data in HLR e.t.c.

CLAIMS

1. Intelligent mobile telecommunications Network arrangement providing services comprising means for providing communication within the Mobile and Intelligent Networks respectively and between at least one logical node of the Intelligent network and at least one logical node of the Mobile Network (PLMN), said means comprising first intra-connecting means (X-MAP) providing communication between a first logical node and a second logical node of the Mobile Network,

c h a r a c t e r i z e d   i n,

that said means for providing communication further comprises first interconnecting means (INAPX;INAPX') separate from said intraconnecting means for providing communication between a logical node of the Mobile Network (an MN-node) and a first logical node of the Intelligent Network or a so called IN-node.

2. Arrangement according to claim 1,

c h a r a c t e r i z e d   i n,

that first intraconnecting means (X-MAP) comprises a first signalling protocol and provides communication between a first and a second Mobile Network node.

3. Arrangement according to claim 2,

c h a r a c t e r i z e d   i n,

that the first signalling protocol is an Extended or Enhanced Mobile Application Part (X-MAP).

4. Arrangement according to any one of the preceding claims,

c h a r a c t e r i z e d   i n,

that the first interconnecting means (INAPX;INAPX') is a second signalling protocol.

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5. Arrangement according to claim 4,
c h a r a c t e r i z e d   i n,
that the second signalling protocol is an Intelligent Network
Application Part (INAPX;INAPX').

6. Arrangement according to any one of the preceding claims,
c h a r a c t e r i z e d   i n,
the first logical Mobile Network node (MN-node) is a Home
Location Register.

7. Arrangement according to claim 6,
c h a r a c t e r i z e d   i n,
that the second logical MN-node is a Mobile Switching Cen-
tre/Visitor Location Register (MSC/VLR).

8. Arrangement according to any one of the preceding claims,
c h a r a c t e r i z e d   i n,
that the first logical IN-node is a Service Control Point
(SCP).

9. Arrangement according to anyone of the preceding claims
c h a r a c t e r i z e d   i n,
that the first interconnecting means (INAPX) connects the
first logical IN-node (SCP) with the first logical MN-node
(HLR).

10. Arrangement according to anyone of claims 1-8,
c h a r a c t e r i z e d   i n,
that the first interconnecting means, (INAPX') connects the
first logical IN-node with at least the second logical MN-
node.

11. Arrangement according to any one of claims 1-10,
c h a r a c t e r i z e d   i n,
that the first extended interconnecting means, (INAPX) also
provides for signalling between the first logical IN-node
(SCP) and a second logical IN-node (SSP).

12. Arrangement according to claim 11,
c h a r a c t e r i z e d   i n,
that the second logical IN-node is a Service Switching Point
(SSP).

13. Arrangement according to any one of the preceding claims,
c h a r a c t e r i z e d   i n,
that at least the two first nodes of the Intelligent and
Mobile Networks respectively which are inter-connected, are
inter-connected in such a way that subscriber data exchange
is offered/provided between a Home Location Register (HLR)
and at least one Mobile Service Control Point (M-SCP).

14. Arrangement according to claim 6,
c h a r a c t e r i z e d   i n,
that the first MN-node (HLR) acts as a Service Data Point
(SDP) towards the first logical IN-node which is a Service
Control Point (SCP).

15. Arrangement according to claim 14,
c h a r a c t e r i z e d   i n,
that the Home Location Register which can be seen as a
Service Data Point, i.e. HLR/SDP comprises Service Data
Functions (SDF) and a Home Location Register database.

16. Arrangement according to claim 7,
c h a r a c t e r i z e d   i n,
that the second logical MN-node comprises Service Data
Functions (SDF), and a Mobile Switching Centre/Visitor Loca-
tion Register-database.

17. Arrangement according to any one of the preceding claims,
c h a r a c t e r i z e d   i n,
that the Service Switching Functions are integrated in the
Visited Mobile Switching Centres (V-MSC).

18. Arrangement according to any one of the preceding claims,

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c h a r a c t e r i z e d   i n,
that furthermore the Public Switched Telephone Network, PSTN,
is inter-connected logically with the Intelligent Network.

5   19. Arrangement according to any one of the preceding claims,
c h a r a c t e r i z e d   i n,
that the signalling protocols apply the CCITT-signalling
system No. 7.

10   20. Arrangement according to any one of the preceding claims,

c h a r a c t e r i z e d   i n,
that when Intelligent Network processing is desired for an
incoming call from e.g. PLMN or PSTN, the call is routed to
15   a Service Switching Point, (SSP), wherein the Service Swit-
ching Functions (SSF) collect data which is communicated to
the Service Control Point (SCP) via the extended signalling
protocol (INAPX;INAPX').

20   21. Arrangement according to claim 20,
c h a r a c t e r i z e d   i n,
that the Service Control Functions (SCF) request mobile data
from PLMN via the Home Location Register/Service Data Point
(HLR/SDP) via the extended (second) signalling protocol
25   (INAPX).

22. Arrangement according to claim 21,
c h a r a c t e r i z e d   i n,
that the Home Location Register/Service Data Point (HLR/SDP)
30   requests data from the Mobile Switching Centre/Visitor
Location Register (MSC/VLR) database, said data being pro-
vided or communicated via the first signalling protocol, the
Mobile Application Part, (X-MAP).

35   23. Arrangement according to claim 20,
c h a r a c t e r i z e d   i n,
that the Service Control Functions (SCF) request mobile data

directly from MSC/VLR via the extended second signalling protocol INAPX'.

24. Arrangement according to any one of the preceding claims,

c h a r a c t e r i z e d   i n,
that the Mobile Network is the GSM-network.

25. Arrangement according to any one of the preceding claims,
c h a r a c t e r i z e d   i n,
that it comprises logical inter-connection of the Integrated Services Digital Network (ISDN).

26. Arrangement according to any one of the preceding claims,
c h a r a c t e r i z e d   i n,
that the data requested by the Intelligent Network comprises data which is inherent to the network such as the Location number and/or Call Delivery Information.

27. Arrangement according to anyone of the preceding claims,
c h a r a c t e r i z e d   i n,
that data is updated in HLR via the extended signalling protocol (INAPX;INAPX').

28. Telecommunication system comprising a cellular mobile network (MN) and an intelligent network (IN) and means for providing communication between at least one logical node of the mobile network (MN) and at least one logical node of the intelligent network,
c h a r a c t e r i z e d   i n ,
that the means for providing communication between nodes of the mobile and the intelligent network comprises a second signalling protocol (INAPX; INAPX') interconnecting a service switching point (SCP) with a first logical node of the mobile network which node forms a service data point (SDP) to the intelligent network (IN) so that data can be transferred at any time between the mobile network (MN) and the service

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control point (SCP) of the intelligent network (IN).

29. System according to claim 28,
c h a r a c t e r i z e d   i n ,
5   that the first logical node of the mobile network (MN) is a
Home Location Register (HLR) and in that first intra-
connecting means provides communication between the Home
Location Register (HLR) and a Mobile Switching Center/Visitor
Location Register (MSC/VLR) of the mobile network (MN)
10   wherein the first intra-connecting means (MAP) are different
and separate from the first interconnecting means (INAPX;
INAPX').

30. Method for providing services such as e.g. Universal
15   Personal Telecommunications Services (UPT-Services) in a
Mobile Intelligent Network comprising the following steps:

       –   examining if Intelligent Networking Processing is
               required; if yes, the method is characterized by the
20   following steps:
       –   the incoming call is routed to a Service Switching
               Point of the Intelligent Network,
       –   the Service Switching Functions of the Service Swit-
               ching Point collects relevant data,
25   –   the Service Switching Functions communicate with
               another logical node of the Intelligent Network, the
               Service Control Point, via a second signalling pro-
               tocol, an extended Intelligent Network Application
               Part(INAPX),
30   –   the Service Logic Programme interpreters the data
       –   the Service Control Functions (SCF) requires data from
               the Mobile Network via the extended second signalling
               protocol, Intelligent Network Application Part X
               (INAPX),
35   –   the Home Location Register/Service Data Point
               (HLR/SDP) in the Mobile Network require data from the
               Mobile Switching Center/Visitor Location Register

(MSC/VLR) database or at least part of the data is
provided directly from MSC/VLR to M-SCP via INAPX',
-   the Home Location Register/Service Data Point
    (HLR/SDP) provides the Service Control Functions of
5   the Intelligent Network with at least some of the
    required data
-   the Service Control Functions (SCF) continue with
   service interpretation and execution.

FIG.1

FIG.2

FIG.3

FIG.4

FIG.5

```
                    ┌─────────────┐
                   (   INCOMING   )
                   (     CALL     )
                    └──────┬──────┘
                           │
                          ◇◇◇
                         ◇    ◇
                        ◇  IN- ◇          NO       ┌─────────────────┐
                       ◇PROCESSING◇ ──────────────▶│ CONVENTIONAL    │
                        ◇ NEEDED ◇                  │ PROCESSING      │
                         ◇   ?  ◇                   └─────────────────┘
                          ◇◇◇
                      YES  │
                           │
                    ┌──────┴──────┐
                    │ CALL ROUTED │
                    │ TO SSP OF   │
                    │ IN          │
                    └──────┬──────┘
                           │
                    ┌──────┴──────┐
                    │ SSF OF SCP  │
                    │ REQUIRE DATA│
                    │ FROM SCF OF │
                    │ SCP         │
                    └──────┬──────┘
                           │
                    ┌──────┴──────┐
                    │ SLP-INTERPRET.│
                    │ IN SCF      │
                    └──────┬──────┘
                           │
                          ◇◇◇
                         ◇     ◇
                        ◇ MOBILE ◇         NO
                       ◇  DATA   ◇ ──────────────────┐
                        ◇ NEEDED ◇                   │
                         ◇   ?   ◇                    │
                          ◇◇◇                         │
                      YES  │                          │
                           │                          │
                          ◇◇◇                         │
                         ◇     ◇                       │
                        ◇ DATA  ◇        YES           │
                       ◇AVAILABLE◇ ───────────┐        │
                       ◇IN HLR/SDP◇            │        │
                        ◇   ?   ◇              │        │
                         ◇◇◇                    │        │
                       NO  │                    │        │
                           │                    │        │
                    ┌──────┴──────┐             │        │
                    │ REQUIRE     │             │        │
                    │ DATA FROM   │             │        │
                    │ MSC/VLR     │             │        │
                    └──────┬──────┘             │        │
                           │                    │        │
                ┌──────────┴──────────┐         │        │
                │ DATA COMMUNICATED    │         │        │
                │ TO HLR/SDP          │         │        │
                └──────────┬──────────┘         │        │
                           │◀───────────────────┘        │
                    ┌──────┴──────┐                       │
                    │ DATA TO     │                       │
                    │ SCP         │                       │
                    └──────┬──────┘                       │
                           │◀──────────────────────────────┘
                ┌──────────┴──────────┐
                │ SERVICE INTERPRET.   │
                │ AND EXECUTION        │
                │ IN SCF              │
                └─────────────────────┘
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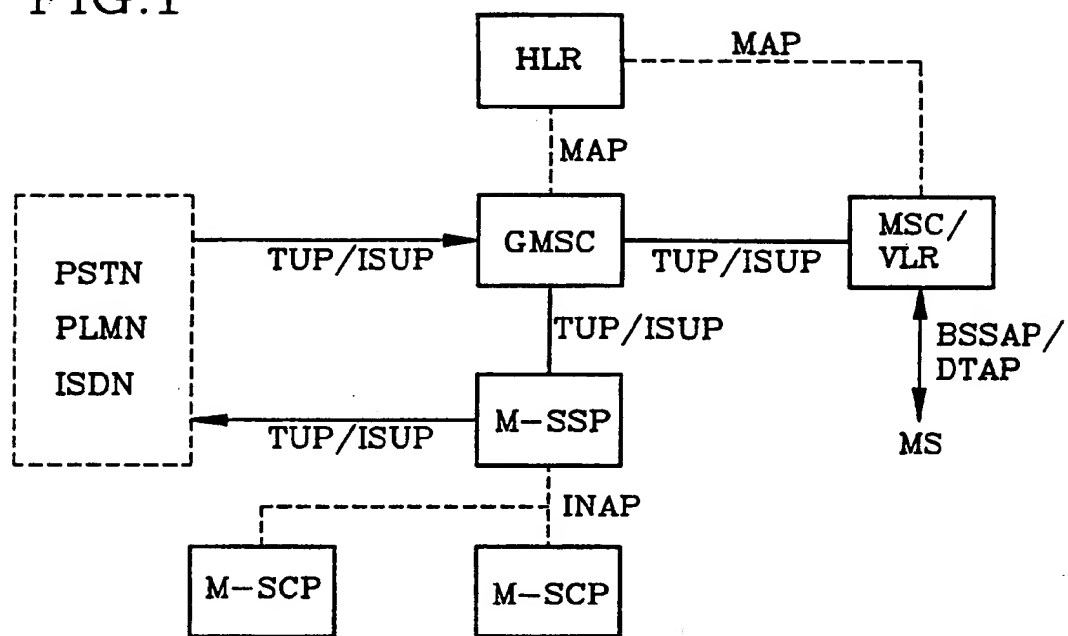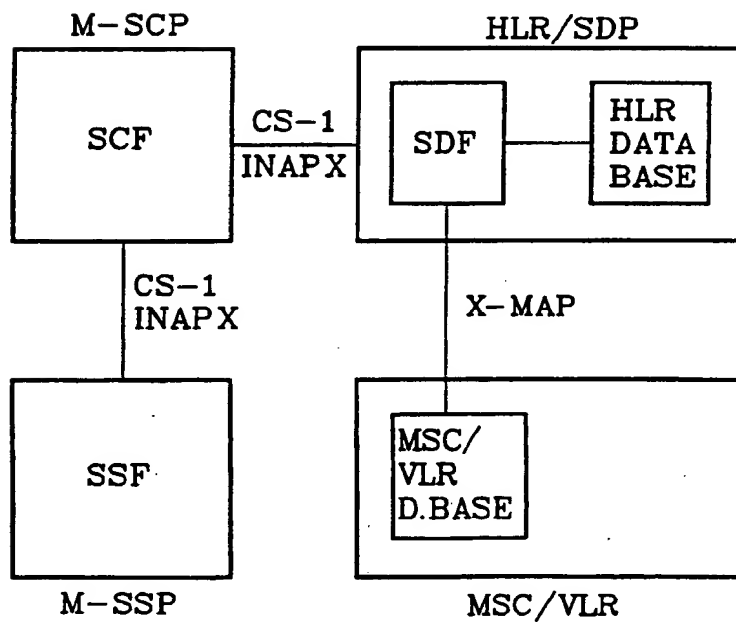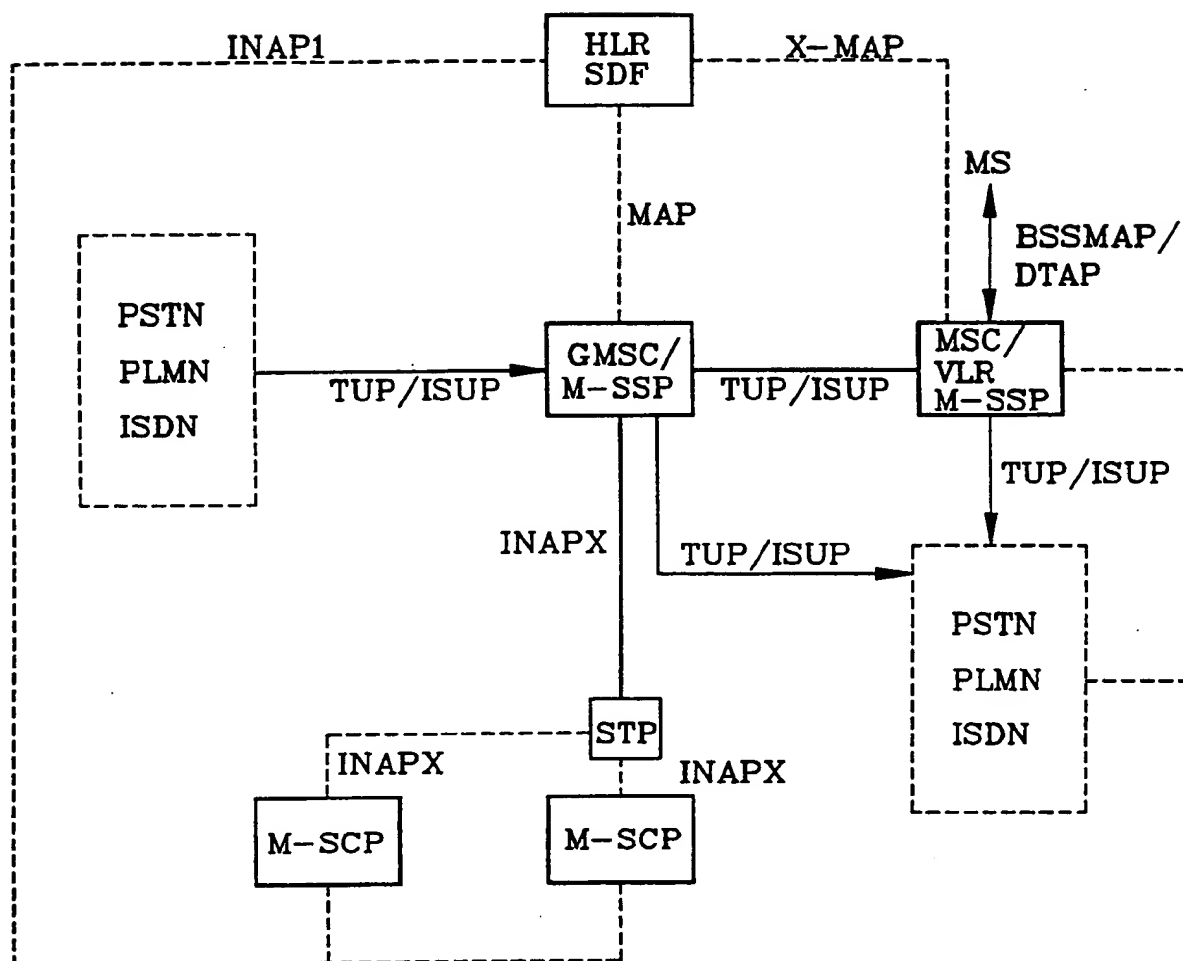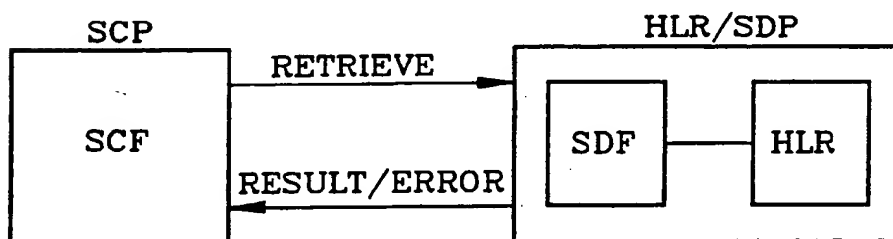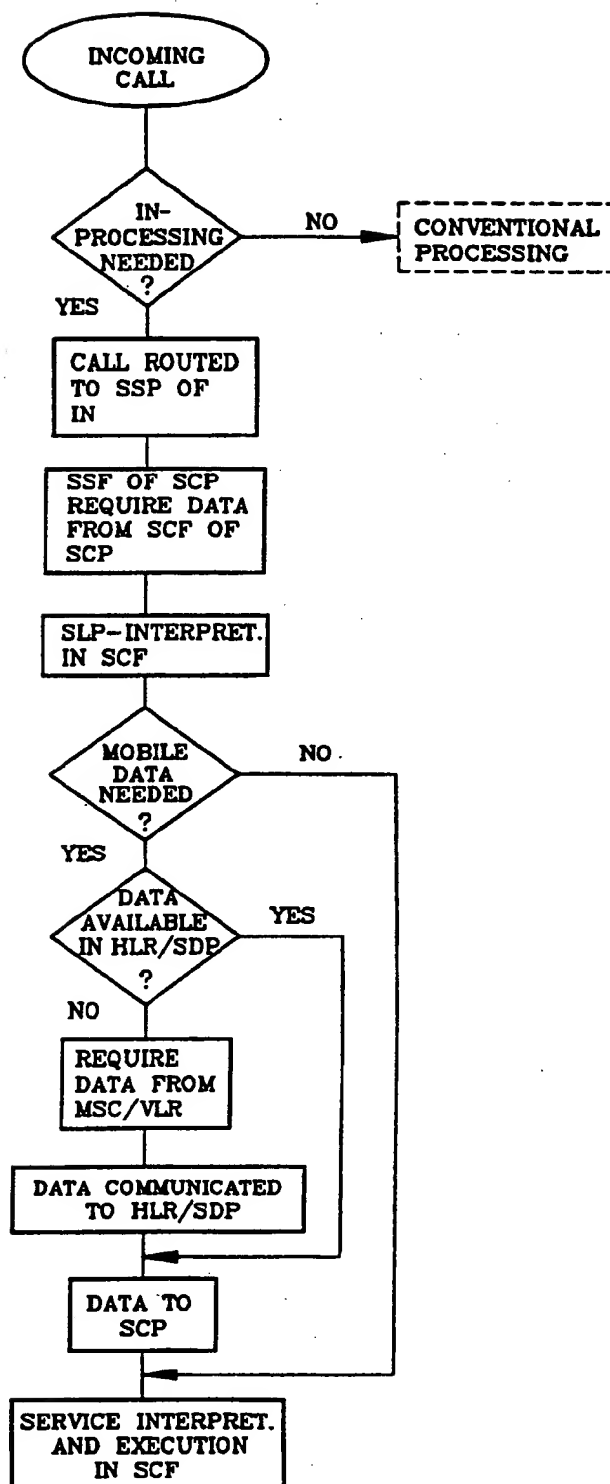
FIG.6
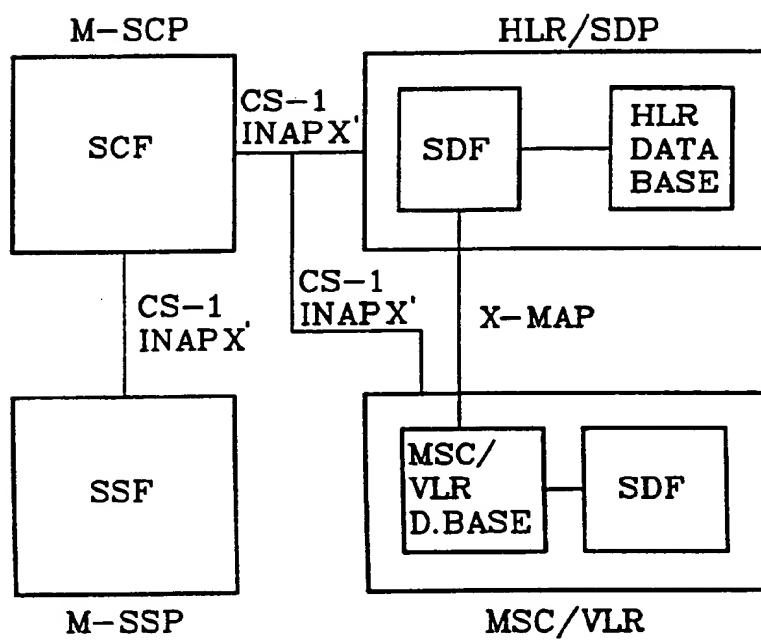
INTERNATIONAL SEARCH REPORT

	International application No.
	PCT/SE 95/00294

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9318606 A1 (BELL ATLANTIC NETWORK SERVICES INC.), 16 Sept 1993 (16.09.93), page 18, line 5 - line 28; page 20, line 26 - page 21, line 19; page 22, line 10 - line 21, figures 1,2	1,2,4,5,9, 10,18,19
Y		3,6-8,11-17, 20-30
	--	
Y	EP 0466078 A2 (ALCATEL CIT), 15 January 1992 (15.01.92), column 2, line 41 - line 55; column 4, line 44 - column 5, line 18; column 6, line 4 - line 18, figure 2	3,6-8,11-17, 20-30
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☐ Further documents are listed in the continuation of Box C.	☒ See patent family annex.	

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 July 1995	0 3 -08- 1995

Name and mailing address of the ISA/	Authorized officer
Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Bengt Jonsson Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1992)

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 9318606	16/09/93	US-A- 5353331	04/10/94
EP-A2- 0466078	15/01/92	CA-A- 2046579 FR-A,B- 2664780 FR-A,A,B 2667476 JP-A- 4255133	12/01/92 17/01/92 03/04/92 10/09/92